

XXII.—*Natural History Notes from H.M. Indian Marine Survey Ship 'Investigator,' Commander T. H. Heming, R.N., commanding.*—Series II., No. 25. *A Note on the Deep-sea Fishes, with Descriptions of some new Genera and Species, including another probably Viviparous Ophidioid.* By A. ALCOCK, Surgeon-Major I.M.S., Superintendent of the Indian Museum.

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§ 1. Introduction.

In the Ann. & Mag. Nat. Hist. for November and December 1889, September and October 1890, January, July, and August 1891, November 1892, and August 1895, and in the 'Journal of the Asiatic Society of Bengal' for 1893, 1894, and 1896, I have described the fishes dredged by the 'Investigator' in depths ranging from 100–1800 fathoms during the twelve years 1885–1896.

In the present paper some noteworthy species dredged since 1896 are recorded; though two of these (*Raja Powellii*, sp. n., and *Monocentris japonicus*, C. V.) were taken at a depth less than 100 fathoms, yet the occurrence of a temperate genus like *Raja* close to the Indian shores, and the addition of another singular Japanese species to the Indian fauna, are sufficiently interesting to be noticed here.

§ 2. On some Geographical Relations of the Deep-sea Fish-fauna of India.

In my earliest paper (Ann. & Mag. Nat. Hist., Nov. 1889, p. 379) on the deep-sea fishes of the Indian region I drew attention to the fact that several of our species were common, on the one hand to the deeper waters of Madeira, the Mediterranean, and the Atlantic coasts of America, and, on the other hand, to the seas of Japan.

As Dr. Günther had, long before, noticed the correspondences between (1) the Madeiran, Mediterranean, and West-Indian fish-fauna, and (2) the fish-fauna of Japan, and as at

the time I wrote our observations were only beginning, it did not then seem either necessary or advisable to pursue this subject further.

But our investigations are now perhaps sufficiently full to enable us to form an idea of the geographical relations of the deep-sea fish-fauna of India, and sufficiently numerous to be used as a test of certain theories of past geography and zoological distribution that are based on other and various kinds of evidence. I may therefore briefly summarize them.

The total number of species of fishes, exclusive of incidental shore-fishes, at present known to exist in the seas of India at depths over a hundred fathoms is 159, of which 120 have not, so far as is known, been found elsewhere.

Of the 39 previously-known species, the following 6 probably belong to the fauna of the "Necton," and are not therefore made use of in this paper in any argument based on the facts of geographical distribution :—

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| 1. <i>Argyropelecus hemigymnus</i> ,
Cocco. | 4. <i>Gonostoma microdon</i> , Gthr. |
| 2. <i>Sternoptyx diaphana</i> , Herm. | 5. ——— <i>elongatum</i> , Gthr. |
| 3. <i>Polyipnus spinosus</i> , Gthr. | 6. <i>Chauliodus Sloanii</i> , Bl. Schn. |

Of the remaining 33, 6 more may possibly belong to the nectic fauna, though I do not think that they do, and shall not here treat them as if they did. They are :—

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| 1. <i>Hoplostethus mediterraneum</i> ,
C. V., Gthr. | 4. <i>Antigonia capros</i> , Lowe. |
| 2. <i>Polymixia nobilis</i> , Lowe. | 5. <i>Neoscopelus macrolepidotus</i> ,
Johns. |
| 3. <i>Trachichthys Darwinii</i> , Johns. | 6. <i>Macrurus lævis</i> , Lowe. |

Of the remaining 27, 15 appear to be identical with species that were dredged, chiefly by the 'Challenger,' at corresponding depths in the basins of the East-Indian Archipelago and neighbouring Western Pacific. These hardly call for further notice.

Of the remaining 12, 1 (*Scyllium canescens*, Gthr.?) appears to be identical with a 'Challenger' species from the Patagonian fjords (Pacific side). Singular as this distribution may seem, it is shared by several species among the Echino-derma, Crustacea, Pycnogonida, and Mollusca. And if genera, rather than species, are considered, it will be found that quite a considerable number are common to Indian seas and the Pacific slopes of South America—from Panama to Patagonia.

There are left 11 previously-known species that share with

the 6 species classed as just possibly belonging to the nectic fauna a curious and most suggestive geographical distribution. These are:—

Chiasmodon niger, Johns., known from the West Indies and Atlantic coasts of the United States; from the mid-Atlantic and Madeira; and from the Bay of Bengal.

Chaunax pictus, Lowe, known from the West Indies and the Atlantic coast of the United States; from Madeira, Cape Verd Islands, and neighbourhood; from Japan and Fiji; and from the Bay of Bengal and the Gulf of Manár.

Dicrolene intronigra and *Bathygadus longifilis*, G. & B., known from the West Indies and neighbouring coasts of North America, from the Atlantic coast of North-western Africa, and from the Malabar coast and Andamans.

Diplacanthopoma brachysoma, Gthr., known only from off the coast of Brazil (Pernambuco) and from the Andaman Sea.

Macrurus (Mystacourus) cavernosus, G. & B., known only from the Gulf of Mexico and from Ceylon and the Andaman Sea. (Specimens from both regions compared.)

Bathytroctes microlepis, Gthr., known only from the Mediterranean gate of the Atlantic and from the Andaman Sea. (Our specimen is in bad preservation, and its identification is therefore doubtful.)

Platytrectes apus, Gthr., known only from the mid-Atlantic and from off the Malabar coast.

Leptoderma macrops, Vaillant, known only from the Atlantic coasts of North-western Africa and from the Bay of Bengal.

Uroconger vicinus, Vaillant, known only from the Atlantic coasts of North-western Africa and from the Laccadives and Bay of Bengal.

Synaphobranchus pinnatus, Gray, Gthr., known from the Atlantic coasts of the United States and Brazil; from the Azores, Canaries, and Cape Verd Islands; from the Philippines and Japan; and from off the Maldives and Cape Comorin. (Compared with a 'Challenger' duplicate.)

Let us compare now the distribution of the 6 species above referred to as possibly, but not probably, oceanic. These are:—

Hoplostethus mediterraneum, C. V., Gthr.: Atlantic coasts of the United States, Madeira and neighbouring coasts and islands of that part of the Atlantic, Mediterranean Sea, Japanese Seas, Malabar coast, and Bay of Bengal.

Polymixia nobilis, Lowe: West Indies, Madeira and neigh-

bouring parts of the Atlantic, Japan, Mauritius, Andaman Sea.

Trachichthys Darwinii, Johns.: Madeira, Japan, Bay of Bengal.

Antigonia capros, Lowe: West Indies, Madeira, Arafura Sea, Japan, Bay of Bengal. (Compared with 'Challenger' duplicate.)

Neoscopelus macrolepidotus, Johns.: West Indies and neighbouring coasts of the United States, Madeira, Australasian Seas, Andaman Sea. (Compared with a 'Challenger' duplicate.)

Macrurus (Malacocephalus) laevis, Lowe: North and South Atlantic, seas of Northern Europe, Mediterranean, Hawaiian Islands, Andaman Sea.

From the above list we see that of the 33 species of deep-sea fishes (excluding the undoubted nectic species) that India is known to share with other parts of the world, 17 species, or 51 per cent. (and 10 per cent. of the whole fish-fauna in question), are found in certain very suggestive areas of the North Atlantic, namely off the West Indies and neighbouring coasts of America and in the approaches to the Mediterranean Sea.

This of itself would be almost enough to suggest a former direct connexion between those waters and the seas of India; and the fact that so many of the species under consideration also occur in Japan is suggestive of still further-reaching sea-connexions.

So far as the Japanese seas are concerned, this idea has long been familiar to Dr. Günther, who, in the 'Journal of the Linnean Society' for 1874-76 (Zoology, vol. xii.), pp. 107-139, gives a list of 29 Japanese shore-fishes, of which 22 also belong to the Mediterranean and 18 to the West-Indian fauna, and 11 are common to all three regions, and who, in the 'Introduction to the Study of Fishes,' p. 270, says, in comparing the shore-fishes of Japan with those of the Mediterranean:—"We can only account for the singular distribution of these shore-fishes by assuming that the Mediterranean and Japanese seas were in direct and open communication with each other within the period of the existence of the present Teleosteous fauna."

It is not, however, alone, or even principally, from the Fishes that the zoological evidence * in support of a former

* "Zoological," because I understand that the *geological* evidence in favour of a former (Eocene or Miocene) open-sea connexion between the

connexion, by way of the Mediterranean Sea, between the Tropical Atlantic and the Indo-Pacific is to be derived; corroborative evidence appears to be furnished by every group among the 'Investigator' collections that has been examined.

(a) Among the Hexactinellid Sponges, which have been determined for us by Professor F. E. Schulze, we find:—

(1) *Aphrocallistes Bocagei*, P. Wright, which is known from the West Indies, from Spain, Portugal, and the Cape Verd Islands, from the North-eastern Atlantic, and from Japan, and has been dredged by the 'Investigator' in 130–265 fath.; and (2) *Farrea occa*, Carter, which occurs in the West Indies, in Japan and the Philippines, and also off the Andamans at 220–240 fath.

(b) Among the Madreporarian Corals are *Caryophyllia communis*, Seg. Mos., and *Flabellum laciniatum*, Phil. These two Atlantic species are frequently found in Indian Seas at depths between 200 and 700 fath. As they occur fossil in the Tertiary deposits of Sicily and Southern Italy, they have here a special interest. We also find in the Andaman Sea a *Deltocyathus* that seems to be nothing more than a variety of the *Deltocyathus italicus* (Mich.), E. & H., of the North Atlantic and of the Miocene of Northern Italy.

(c) Among the Echinoderms, which have been named by Dr. J. H. T. Walsh (Holothurians), Prof. R. Koehler (Ophiuroids), and myself (Starfishes), the following are common to the Atlantic and the seas of India:—*Porcellanaster cæruleus*, Wy. Thoms., *Nymphaster basilicus*, Sladen, *Nymphaster protentus*, Sladen, *Ophiomusium validum*, Ljungmann, *Ophiernus adspersus*, Lyman, *Ophiocamax fasciculata*, Lyman, *Astronyx Loveni*, M. & T. (also occurs in Japan), *Eupyrgus scaber*, Lütke. (also occurs in Arctic Seas). None of these are true abyssal forms.

(d) Among the Crustacea the following, four of which were determined by the late Prof. J. Wood-Mason, are common to the seas of the East and West Indies and neighbourhood:—*Bathynomus giganteus*, A. M.-Edw. (not found elsewhere), *Pontophilus gracilis*, S. I. Smith (not found elsewhere), *Phoberus cæcus*, A. M.-Edw. (? also in the Arapura Sea), *Uroptychus nitidus*, A. M.-Edw. (not elsewhere),

West Indies and Mediterranean on the one hand, and in favour of a former (Cretaceous and Eocene) open-sea connexion between Europe, across the Sahara and Arabia, far into India, on the other hand, is very strong. My object here is simply to show how certain geological generalizations appear to be in some way confirmed by the zoological facts recorded in this series of papers.

Lithodes Agassizii, S. I. Smith (also from the Azores),
Pylocheles Agassizii, A. M.-Edw. (not elsewhere).

And the following are common to the northern parts of the North Atlantic and the Indian seas:—*Nephropsis atlantica*, Norman, and *Calocaris Macandreae*, Bell, the latter having been also found at New Zealand.

No nectic or abyssal species are included in this list.

(e) Among the Mollusca, which have been identified by Mr. E. A. Smith and Mr. E. S. Goodrich (Cephalopods), 4 out of 20 deep-sea species that are known to occur elsewhere are common to India and the North Atlantic. They are:—*Solariella infundibulum*, Watson (also occurs off the Crozets), *Puncturella asturiana*, Fischer, *Lucina spinifera*, Montagu, and *Octopus januarii*, Ststp., which last has also been taken in the Eastern Pacific.

Altogether, of the species that inhabit the moderate depths (100–1000 fathoms) of the Indian seas and are also known from corresponding depths elsewhere, $\frac{42}{113}$ ths are known from the Atlantic north of 10° S., and $\frac{38}{113}$ ths are identical with species that also belong either to the deep fauna of the West Indies and neighbouring coasts of America, or to the deep fauna of the Atlantic approaches to the Mediterranean.

This—which expressly excludes all true abyssal as well as “Necton” species—is, so far as we know, a larger number of thus limited deep species than the seas of India have in common either with the basins of the East-Indian Archipelago or with the seas of Japan, although it is interesting to note that the affinities of the Indian with the Japanese deep fauna are very well marked—28 species being common to the moderate depths of the two regions.

For fuller details I would refer to a Report, now in the press, upon the deep-sea Madreporaria dredged by the ‘Investigator,’ and to a paper (to be shortly published in the ‘Scientific Memoirs of the Medical Officers of the Army of India’) summarizing the zoological observations of the ‘Investigator’ between the years 1884 and 1897.

To the list of Fishes common to the West Indies and the Bay of Bengal and Andaman Sea must be added

Bembrops gobioides (Goode) [= *Hypsicometes gobioides*, Goode,
 = *Bembrops platyrhynchus*, Alcock].

In the Indian Museum there is one of the ‘Albatross’ (?) duplicates of *Hypsicometes gobioides*, presented to us by the

Smithsonian Institution, and it is identical with the species that I had described and figured as *Bembrops platyrhynchus*.

Bembrops gobioides (Goode), which appears to be a common species in the Caribbean Sea and Gulf of Mexico at depths of from 68 to 324 fath., has been dredged by the 'Investigator' off the Madras coast in 128 fath., and in the Andaman Sea at 185 and 194 fath.

I take this opportunity of giving the synonymy of the genus and species:—

BEMBROPS, Steindachner.

Bembrops, Steindachner, SB. Ak. Wien, lxxiv. 1877, i. p. 211; Alcock, Journ. As. Soc. Bengal, vol. lxiii. 1894, pt. 2, p. 118, and vol. lxxv. 1896, pt. 2, p. 316.

Hypsicometes, Goode, Proc. U.S. Nat. Mus. iii. 1880, p. 347; Günther, 'Challenger' Deep-sea Fishes, p. 85; Jordan and Gilbert, Bull. U.S. Nat. Mus. xvi. p. 808; Goode and Bean, Oceanic Ichthyology, p. 290.

Bathypercis, Alcock, Journ. As. Soc. Bengal, vol. lxii. 1893, pt. 2, p. 177.

Bembrops gobioides (Goode).

Hypsicometes gobioides, Goode, *loc. cit.*; Günther, *loc. cit.*; Jordan and Gilbert, *loc. cit.*; Goode and Bean, *loc. cit.* fig. 263.

Bathypercis platyrhynchus, Alcock, *loc. cit.* pl. ix. fig. 1.

Bembrops platyrhynchus, Alcock, *loc. cit.*

I have only to add that my description and figure were made from a young individual; in the adult, of which we have lately received several specimens from the 'Investigator,' the proportions of the body are different.

§ 3. General Composition of the Deep-sea Fish-fauna of India.

As regards the composition of the deep-sea fish-fauna of India, so far as our present knowledge goes, it is made up as follows:—

Chondropterygii,	about 4 per cent.
Acanthopterygii,	„ 24 „
Anacanthini,	„ 35 „
Physostomi,	„ 36 „
Plectognathi,	„ 0·6 „

In these, as in other seas, certain families are characteristic of the depths. They are:—

Ophidiidæ,	which form nearly	15	per cent. of the whole.
Macruridæ,	"	13	" "
Muraenidæ,	"	about 10	" "
Scopelidæ,	"	7·5	" "
Alepocephalidæ,	"	6·5	" "

The family Pediculati is particularly well represented in these seas, where, between 128 and 1260 fathoms, we find twelve species (*i. e.* about 7·5 per cent. of the whole), belonging to eight genera. Among them it is interesting to notice three forms (*Dibranchus*, *Multhopsis*, *Halicometus*) in which more or less marked degeneration of the locomotor organs is correlated with a more than ordinary reduction in the number of gills.

§ 4. *Descriptions of new Species.*

Ten new species are described; they will all be figured in an early issue of the "Illustrations of the Zoology of the 'Investigator.'"

Among the new forms two, besides the two already mentioned, are specially interesting; they are:—(1) *Benthobatis*, a blind torpedo perhaps more nearly allied to the Eastern Pacific *Discopyge* than to any other member of the family; and (2) a new species of *Diplacanthopoma* that is evidently, like one of its congeners, viviparous. This is the third species of *Diplacanthopoma* discovered in these seas; the type of the genus was dredged by the 'Challenger' in a moderate depth off Pernambuco.

PLAGIOSTOMATA SELACHOIDEI.

Family Spinacidæ.

CENTROPHORUS, M. & H., Gthr.

Centrophorus Rossi, sp. n.

Near *C. calceus* (Lowe), *C. foliaceus*, Günther, and *C. obscurus*, Vaillant.

Snout spatulate, much produced, its preoral portion (measured from the most convex point of the upper jaw) being at least twice the distance between the angle of the mouth and the first gill-opening, and more than $2\frac{1}{2}$ times the distance between the nostrils.

The labial fold extends considerably more than halfway between the angle of the mouth and the middle of the lower jaw.

Teeth of upper jaw erect, triangular, very acute, in two series; teeth of lower jaw acute, very oblique, in a single series.

The posterior borders of all the fins are frayed or fringed, this not being due to abrasion. The angle of the pectoral is rounded; the extremity of the ventral is almost in the perpendicular with the after limit of the base of the second dorsal. The dorsal spines (measured obliquely as they stand) are not much more than half the greatest height of their fins, but their points project well beyond the skin; the second dorsal is a little larger than the first.

Scales minute, acutely tridentate.

Colour uniform jet-black.

A single specimen, 10 inches long, from off the Travancore coast, 430 fath.

Named in memory of Captain Daniel Ross, who, according to Sir Clements Markham, was the first Indian "Marine Surveyor-General" (1823-1833) who introduced a really scientific method into marine surveying in India.

PLAGIOSTOMATA BATOIDEI.

Family Torpedinidæ.

BENTHOBATIS, gen. nov.

The whole animal invested in a loose, soft, naked, glandular skin.

Tail very distinct from the oval disk and *without distinct lateral folds*. Two dorsal fins on the tail; caudal fin well developed.

Nasal valves confluent into a quadrangular curtain.

Teeth flat, rhomboidal, with the posterior angle acutely produced.

Spiracles large, situated immediately behind the *inconspicuous and quite rudimentary eyes*.

A large electric organ between the head and either pectoral fin.

This curious blind torpedo differs from all other members of the family in having the eyes quite rudimentary and in the absence of lateral folds of skin on the tail. In general form it resembles *Narcine*, though the disk is not quite so broad. The teeth, like those of *Discopyge*, have the posterior angle produced, but more acutely than in *Discopyge*, judging from Tschudi's figure.

Benthobatis Moresbyi, sp. n.

The disk is oval, its long axis, which is fore and aft, is a little shorter than the tail. The large, flat, semicircular snout occupies a good deal more than a third the whole length of the disk.

The eyes are represented by two small unpigmented spots, each not much bigger than the head of a pin, situated one in front of either spiracle; a slender optic nerve passes to each, and expands into a vesicle so small as to need a lens for its recognition.

The mouth is small and protractile; the teeth are small rhomboidal plates, with the posterior angle strongly and acutely produced, and are arranged in mosaic in oblique series. The gill-openings are large and well-spaced.

The dorsal fins are placed rather close together behind the level of the ventrals, and, like the caudal, are thick and fleshy. The ventrals are of the usual shape; though they are separate, the skin between them is loose and copious. The whole animal is covered with a perfectly smooth, soft, glandular, purplish-black skin; scattered on the disk and round the edge of it are some small white pores, not much smaller than the eyes; in one specimen part of the tips of the second dorsal and caudal fins are white.

Two males (each about 14 inches long) and a young one, from off the Travancore coast, 430 fath.

Named in memory of Capt. Moresby, of the Indian Navy, whose surveys (1834-38) in the seas where this curious fish is found are known to all readers of Darwin's 'Coral-Reefs.'

Family Rajidæ.

RAJA, Cuv., Gthr.

Raja Powellii, sp. n.

Near *R. Murrayi*, Gthr., but has a more produced snout and, sex for sex, is much smother.

The preoral portion is a little more than a third the entire length of the disk, and ends in a projecting snout, the length of which beyond the nostrils is somewhat more than the distance between the outer angles of the latter.

The antero-lateral margins of the disk, from the snout to the rounded pectoral angles, are broadly sinuous. The width of the interorbital space is hardly more than the length of the orbit. There are several spines on the anterior edge of the orbit and one near its posterior angle, and there are numerous

little spicules on the dorsal surface of the snout, as well as on parts of both the dorsal and ventral surfaces of the antero-lateral margin. There is a row of three large spines on the middle line of the nape, and there are at least two rows of smaller spines on the posterior fourth of the disk, in the middle line.

The tail is as long as the disk and is armed, both on the dorsal surface and on the sides, with rows of spines, those on the sides being smaller and more numerous than those on the dorsum.

The caudal fin, which is present on the dorsal surface only, is confluent with the second dorsal.

The teeth form a pavement; in the female in the upper jaw they are indistinctly tricuspid (the lateral cusps very small and blunt), in the lower jaw they are more distinctly tricuspid.

Colours: upper surface warm brown, with a pair of large, light-centred, light-edged, chocolate ocelli near the middle of the back.

A female, $12\frac{1}{2}$ inches long, from the Gulf of Martaban, 67 fath. (Temperature *probably* about 62° Fahr.)

Named in memory of Lieutenant Powell, of the Indian Navy, Captain Moresby's colleague.

PHYSOSTOMI.

Family Scopelidæ.

BATHYPTEROIS, Günther.

Bathypterois atricolor, Alcock.

Bathypterois atricolor, Alcock, Journ. As. Soc. Bengal, vol. lxx. pt. ii. 1896, p. 306, and Illustrations of the Zoology of the 'Investigator,' Fishes, pl. xvii. fig. 6.

This species was described and figured from a single injured specimen.

The number of dorsal and anal rays is sometimes less than in the type specimen; the number of pectoral rays is altogether 14, and the two detached rays reach at least as far as the end of the caudal fin.

The curious notch at the ventral base of the caudal fin is present in every specimen dredged.

This species appears to come nearest to *B. dubius*, Vaillant.

Off Laccadives, 891 fath.; off Maldives, 459 fath.; off Cape Comorin, 824 fath.

Family Stomiatiidæ.

THAUMASTOMIAS.

Thaumastomias atrox, Alcock.

Thaumastomias atrox, Alcock, Ann. & Mag. Nat. Hist., Sept. 1890, p. 220, pl. viii. fig. 7.

Lütken (Dansk. Vid. Selsk. Skr. 6 Række, Nat. Math. Afd. vii. 6, p. 281, 1892) and Collett (Poissons des Campagnes du yacht 'l'Hirondelle,' p. 131) consider that this species is identical with *Photostomias Guernei* of the latter author. If it were so, it would be very interesting to find another species common to the Azores and the Andamans and Bay of Bengal.

But, although the two forms are possibly congeneric, they are specifically quite distinct. Our two specimens, which are unusually perfect and well-preserved, have neither lingual teeth nor barbel, and have only a single short row of teeth on either palatine. The luminous organs also are different in the two species.

Family Sternoptychidæ.

DIPLOPHOS, Günther.

Diplophos corythæolum, sp. n.

B. 12. D. circ. 11. A. circ. 24. P. 10. V. 7.

Length of head about one fourth, height of body between one fifth and one sixth of the total without the caudal.

The snout, which has the lower jaw prominent, is hardly longer than the eye, which is not quite a fourth the length of the head. The eyes are not quite a diameter apart.

The maxillary almost reaches to the preopercular angle. There is a single row of small, rather distant, acicular fangs of unequal size in either jaw, and a row of close-set acicular teeth on part of the palatines; the whole surface of the mesopterygoids is studded with sharp little denticles.

Gill-openings extremely wide; four gills with short laminæ; gill-rakers, especially those on the first arch, long and bristle-like.

The body has evidently been covered with large thin and deciduous scales.

The dorsal fin arises about an eye-length behind the base of the ventrals, and its last few rays are just above the first few anal rays; its first ray is slightly nearer to the snout

than to the base of the caudal. The long anal fin approaches within less than half a head-length of the base of the caudal. The pectorals are on almost the same plane as the ventrals, and these arise about midway between the base of the former and the origin of the anal.

The luminous organs are in two series on either side, and are of the "bull's-eye" type (a white ball in a black silver-lined pocket); the upper row extends from the basihyal to the base of the caudal fin, but the lower row extends only to the beginning of the anal fin; each of those of the upper row is surmounted by a tiny accessory organ. In addition there are some luminous organs on the head, notably one at the anterior angle of either orbit, and the whole crown of the head (from the snout to the occiput) appears to have been luminous.

Andaman Sea, 405 and 185 fath.

The largest specimen is 5 inches long.

Family Alepocephalidæ.

XENODERMICHTHYS, Günther.

Xenodermichthys squamilaterus, sp. n.

B. 6. D. 20. A. 18. P. 6. V. 6.

Body elongate, compressed, covered with jet-black skin in which scattered granular luminous organs are embedded. The lateral line is a salient tube which runs straight down the middle of the body and is stiffened by thin subcutaneous equidistant scales; in each interspace between the scales is a pore resembling a luminous organ.

Head about $3\frac{2}{3}$, greatest body-height about $5\frac{1}{3}$ in the total without the caudal. Snout about two thirds the length of the eye and about equal to the width of the interorbital space; eye about a fourth the length of the head. Lower jaw slightly prominent, with the symphysis acute. Mouth-cleft wide, the maxilla nearly reaching to the level of the posterior border of the orbit. A close-set row of extremely minute teeth in either jaw only.

Gill-openings wide, the membranes quite separate; four gills, with long close-set gill-rakers; pseudobranchiæ present.

The anal fin lies entirely in the posterior third of the body (measured without the caudal), but the first few dorsal rays are in advance of this. The ventrals are in the after half of

the body and the small pectorals lie close to the ventral profile.

The general structure and arrangement of the stomach, pyloric appendages, and intestine are as described in *X. Guentheri*.

A single specimen, 6 inches long, from off the Andamans, 370–419 fath.

This species is extremely closely related to *X. socialis*, Vaillant ('Travailleur' et 'Talisman' Poissons, pp. 162–165, pl. xiii. fig. 1), and to *X. Guentheri*, mihi (Ann. & Mag. Nat. Hist., Nov. 1892, p. 359, pl. xviii. fig. 3), but is readily distinguished from both by the conspicuous lateral line.

Family Halosauridæ.

HALOSAURICHTHYS, Alcock.

Halosaurichthys nigerrimus, sp. n.

B. 12. D. circ. 12. P. circ. 9. V. 8.

This species very closely resembles *Halosaurichthys carinicauda* (Alcock, Ann. & Mag. Nat. Hist., Dec. 1889, p. 454; Illustrations of the Zoology of the 'Investigator,' Fishes, pl. vii. figs. 2, 2a), but may be recognized by the following specific characters:—(1) The maxilla reaches to the level of the anterior edge of the pupil; (2) the dorsal fold is simply a low fold of skin, which begins at an enlarged scale about two thirds of a head-length behind the dorsal fin and is not continued to the end of the tail; (3) the pectoral fins are extremely narrow and reach much more than halfway to the origin of the ventrals; (4) the colour is uniform jet-black.

Off Maldives, 459 fath.

Family Murænidæ.

NETTENCHELYS, gen. nov.

Nettenchelys is closely related to *Nettastoma* and *Saurenychelys*, but the tail does not taper to a point and the teeth are very different.

Body stout; tail longer than the combined head and trunk. Muciferous cavities of head well developed; snout much produced, broad, depressed; mouth-cleft very wide, broad bands of small conical teeth in jaws and vomer; tongue not free; a tubular nostril situated dorsally near the tip of the snout on either side. Gill-openings of moderate size, well

separated, four gills with wide clefts. No scales; the lateral line, which consists of a single row of pores, is very indistinct in the greater part of its extent. Dorsal and anal fins well developed, confluent with the broad caudal only in the basal half of the latter. No pectoral fins. An air-bladder; no pyloric appendages.

Nettenchelys Taylora, sp. n.

Head, measured to gill-opening, one seventh the total, and half as long as the distance between the gill-openings and the vent; the tail is thus a good deal more than half the total. Snout a third the length of the head (measured to the gill-opening), elongate, broad, depressed, bill-like, the upper jaw overlapping the lower. There is a series of large pores along the upper lip, as also along each side of the lower jaw and along the top of the snout on either side, but the only undoubted nostrils are a largish tubular pair at the tip of the snout. Eyes subcutaneous, not much more than a fourth the length of the snout and not much more than half a diameter apart.

The mouth-cleft reaches behind the eye; the dental surface of both jaws is broad and is crowded with row upon row of close-set conical teeth, which are little more than villiform, though the innermost row in either jaw is slightly enlarged. On the vomer is a long broad convex band of similar teeth—about six longitudinal rows of them. The tongue is large and thick and tapers to a point; it is firmly adherent to the floor of the mouth.

Gill-openings of moderate size, lateral, well separated.

No scales. Although the mucous system and pores of the head are so well developed, those of the lateral line, which are in a single row, very soon become distant, small, and inconspicuous, though they are continued to the end of the tail.

Though the tail tapers it does not end in a point, but in a broad caudal fin, the outer rays of which are confluent only in their basal half with the dorsal and anal fins; these latter are well developed, the dorsal beginning immediately behind the gill-opening. No pectorals.

The stomach forms a *cul de sac* of great length; the air-bladder extends a long way behind the vent.

Colours: dark lavender-grey; dorsal and anal fins with basal half whitish and free half blackish.

A ripe female, 22 inches long, from off the Travancore coast, 430 fath.

Named after Commander A. Dundas Taylor, late Indian Navy, who, in the year 1874, was chiefly instrumental in reviving the Marine Survey of India.

SYNAPHOBRANCHUS, Johns.

Synaphobranchus pinnatus (Gronov.), Gthr.

Synaphobranchus pinnatus, Günther, 'Challenger' Deep-sea Fishes, p. 253, pl. lxii. fig. A (ubi synonym.); Vaillant, Exp. Sci. 'Travailleur' et 'Talisman,' Poissons, p. 88, pl. vi. figs. 2-2 c; Goode and Bean, Oceanic Ichthyology, Mem. Mus. Comp. Zool. xxxvi. 1896, p. 143, pl. xlv. fig. 164.

Two specimens, identical with a 'Challenger' duplicate of this species—one from off the Maldives, 459 fath., the other from off Cape Comorin, 824 fath.—are the first recorded from Indian waters.

This species has a most suggestive range:—Off Madeira (*Johnson*), 740 fath.; off Morocco and neighbouring coasts, Azores, Canaries, and Cape Verd Islands ('*Travailleur*' and '*Talisman*'), 405–3200 metres; off Brazil, 1200 fath., and in the seas of Japan and the Philippines, 345–565 fath. ('*Challenger*'); off the Atlantic coasts of North America up to 1000 fath. ('*Fish-Hawk*,' '*Albatross*,' and '*Blake*').

ACANTHOPTERYGII.

Family Berycidæ.

MONOCENTRIS, Cuv. & Val.

Monocentris japonicus (Houtt.), Cuv. & Val.

Monocentris japonicus, Cuv. & Val. Hist. Nat. Poiss. iv. 461, pl. xvii.; Temm. & Schleg. Faun. Japon., Poiss. p. 50, pl. xxii. fig. 1; Günther, Catalogue of Fishes, vol. i. p. 9.

See also Castelnau, P. L. S. New South Wales, vol. iii. 1878, p. 365; Hilgendorf, SB. Ges. nat. Freunde, Berlin, 1879, p. 22; Macleay, P. L. S. N. S. Wales, vol. v. 1880–81, p. 510; Steindachner and Döderlein, Denk. Ak. Wien, lxvii. 1883, p. 217; Nyström, Bihang Svensk. Vet.-Akad. Handl. xiii. iv. no. 4, 1887, p. 4.

A fine specimen, 6 inches long, was taken in the Gulf of Martaban (Andaman Sea) at 67 fath.

This species, common in the seas of Japan, is said to have also been taken at Port Jackson. It is only one of several singular forms that the recent observations of the '*Investigator*' have shown to be common to Indian and Japanese waters at moderate depths.

Family **Pediculati**.**MALTHOPSIS**, Alcock.*Malthopsis lutea*, Alcock.

Malthopsis lutea, Alcock, Ann. & Mag. Nat. Hist., July 1891, p. 26, pl. viii. figs. 2, 2 a; and Journ. As. Soc. Bengal, pt. 2, 1896, p. 319.

In the description of this species it is stated that the curious striated tubercles that take the place of scales are small, distant, and sunken on the ventral surface of the body. As a matter of fact, in several individuals lately dredged in the Andaman Sea at 185 and 405 fath., these plates in the middle line of the thorax and belly are particularly large and are in close contact.

Family **Cataphracti**.**PERISTETHUS**, Kaup.*Peristethus investigatoris*, sp. n.

Peristethus Murrayi, Alcock (nec Günther), Ann. & Mag. Nat. Hist., July 1891, p. 28.

D. 7/20. A. 21. L. lat. (from occiput) 35-36. L. tr. 4.

Head, measured from tip of preorbital process to hinder angle of operculum, $2\frac{3}{4}$ in the total, greatest body-height a little less than $6\frac{1}{2}$ in the total, without the caudal; greatest breadth of head equal to the length of the combined snout (including processes) and eye.

Preopercular processes short, broadly triangular, their length is not quite a third the distance between their tip and the eye. Preopercular ridge trenchant, ending in a sharp spine, which is about two thirds as long as the eye.

A spine at the posterior angle of the orbit, one on either side of the occiput, one on either post-temporal region, one at the upper angle of the operculum; in young specimens *only* there are three small inconspicuous tubercles, disposed in a triangle, on the forehead.

Interorbital space concave, less than the major diameter of the eye, which is not quite half the length of the snout (processes included).

The large labial tentacles, when laid back, reach beyond the base of the preopercular spine.

All the shields of the body carry a stout recurved spine—eight rows in all.

The anterior ventral plates are irregular in shape, their

greatest length, measured diagonally, is nearly twice their breadth, and is half again as much as the greatest length of the posterior ventral plates.

Colours in life : adults red, young dusky violet ; pectorals, first dorsal, and distal half of labial tentacles black, second dorsal with a black edge.

Andaman Sea, 188-220 fath. (1891) and 405 fath. (1896).

The largest specimen is a little over 6 inches long.

This species appears to be near to *P. platycephalum*, Goode and Bean, from Barbados.

Peristethus serrulatum, sp. n.

D. 7/22. A. 21. L. lat. 33. L. tr. 4.

Head, measured from tip of preorbital process to hinder angle of operculum, a little less than $2\frac{1}{2}$ in the total, greatest body-height a seventh of the total, without the caudal ; greatest breadth of head equal to greatest length of snout.

Preorbital processes long and narrow, their length is nearly half the distance between their tip and the eye. Preopercular ridge sharply serrulate, ending in a curved rather narrow spine, which is nearly as long as the eye. All the bony ridges of the head are finely serrulate or serrate ; in addition there are, on either side, a preorbital, a postorbital, and occipital, a post-temporal and an opercular spine, and on the forehead there are at least five small spines.

Interorbital space concave, less than the major diameter of the eye, which is somewhat less than a third the greatest length of the snout.

The large labial tentacles, when laid back, reach to the after limit of the orbit.

All the shields of the body carry a stout recurved spine—eight rows in all ; those of the posterior third of the lateral line are not simple spines, but are acutely produced both forwards and backwards. The anterior ventral plates are nearly twice as long as broad and nearly twice as long as the posterior ventral plates.

Colours in spirit : flesh-colour, rather dusky dorsally ; distal half of pectorals and edges of vertical fins blackish.

Andaman Sea, 185 fath. (1897).

Two specimens, each about 6 inches long.

ANACANTHINI.

Family Ophidiidæ.

DIPLACANTHOPOMA, Günther.

Diplacanthopoma raniceps, sp. n.

B. 8. D. circ. 110. A. circ. 75. V. 1. L. lat. circ. 74.

The tail (excluding the long tapering caudal fin) is not quite half the total length, and the length of the head is equal to that of the rest of the trunk; the height of the body is contained about $4\frac{2}{3}$ times in the total, without the caudal.

The head (including the branchiostegal rays and a large part of the isthmus, but excluding the occiput) and the greater part of the bases of the dorsal and caudal fins are invested in a thick, glandular, scaleless skin; the head is unarmed, except for two spines, one at the upper, the other at the lower angle of the operculum; these, however, hardly project through the thick loose skin; it is depressed and is very broad, its breadth being considerably more than the length of its post-ocular portion.

The snout is singularly broad, about twice as broad as long, and this, with the broad flat head, gives a very frog-like appearance. The eyes are subcutaneous, large, their major diameter being about two ninths the length of the head, and a good deal more than a diameter apart. Although the mouth is large, the maxilla hardly reaches to the hinder level of the eye, and is much less than half the length of the head. Villiform teeth in bands in the jaws, palatines, and vomer, the band on the premaxilla (only) being interrupted at the symphysis.

Gill-openings extremely wide, the branchiostegal membranes being quite free; gill-rakers short, except for three on the outer border of the first arch; no pseudobranchiæ.

Body covered with small deciduous scales; the lateral line is extremely inconspicuous, and is apparently present only in the anterior part of the body.

The dorsal fin begins immediately above the base of the pectoral; it and the anal are confluent with the caudal, which is almost as long as the post-rostral portion of the head and a little longer than the pointed pectorals. The ventrals are a little more than half the length of the head, each consists of at least two intimately fused rays.

The peritoneum in the male is very thick, and is as tough as a piece of leather, to strengthen and support the copulatory

organ, which it lines. The intestine is much coiled, and there are no pyloric cæca.

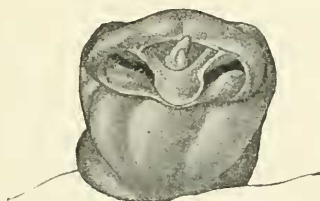
The copulatory organ of the male is massive, and is almost as long as the snout; it is hollow and lined by the peritoneum; the intestine opens at its base, and the testes are prolonged far into it; its free end has almost the consistence of cartilage, and is thrown into deep and intricate folds, from the innermost (anterior) of which a pair of tactile papillæ, one of which is of large size, project, the testes opening by a common orifice into the bottom of the outer (posterior) fold.

The corresponding organ of the female is smaller than that of the male, but still is large; it is a hollow cone lined by peritoneum and containing the ends of the ovaries, which have a common orifice of large size at its free end, which is spongy.

Two males and a female with ripe ova, from the Andaman Sea, 405 fath. (1897).

The largest male is nearly 7 inches long, the female not quite 6 inches.

This species is at once distinguished from *D. brachysoma*, Gthr., and *D. Rivers-Andersoni*, mihi, by the broad frog-like head and snout; in those species the occiput is high and the snout is much depressed, with an upturned tip, but in this



Male organ of *Diplacanthopoma raniceps*, $\times 4$.

species the head is broadly conical and gently and evenly declivous from occiput to tip of snout. Another difference is that in this species the two spines of the operculum are hidden beneath the skin, whereas in both the other species they are very sharply prominent.

From *D. Rivers-Andersoni* this species also differs in its much smaller size.